est, to 12.5 per cent. of the lowest, total tractive resistance.

7. The following urban pavements are enumerated in the order of their desirability for vehicle operation from the point of view of tractive resistance at 20 km. (12.4 miles) per hr., as found in this investigation. (1) asphalt, (2) wood block, (3) hard smooth macadam, (4) brick block, (5) granite block with cement-filled joints, (6) cinder, (7) gravel, (8) granite block with sand-filled joints.

8. The equivalent grade at 20 km. (12.4 miles) per hr. of a badly worn city macadam road, was found to be nearly three times as great as that of the best asphalt road tested. This means, at this speed, a consumption of energy at wheel treads, of nearly three times as much on level poor macadam roads as on good level asphalt roads.

9. Increasing the gross weight of the vehicle by 12 per cent. through load, was found to have no effect on tractive resistance within the observed speed limits for smooth roads in good condition; but on rough roads, a distinct increase in tractive resistance with this extra weight was observed.

10. The presence of a layer of dust, say one cm. thick, on a fair macadam road, was found to increase the equivalent grade of tractive resistance, at a speed of 20 miles (12.4 km.) per hr., from 1.17 to 1.32 per cent.

11. A freshly tarred and therefore very soft tar-macadam road was found to have an increased tractive resistance equivalent grade, at substantially all tested speeds, of about 0.5 per cent. The tires in this case sank about 0.8 inch (2 cm.) into the road-bed, the gross car weight being 2,140 kg. (4,710 lb.).

12. The total range of tractive resistance equivalent grade covered in the tests, was from 0.93 per cent. on the best asphalt road, at lowest speed, to 2.7 per cent. on the worst macadam road, at nearly the highest speed.

13. The results indicate, as has already been pointed out by other observers, the importance of constructing and maintaining smooth, hard and clean roads, from the point of view of tractive resistance. Low tractive resistance means small gasoline consumption for gasoline trucks, and a reduced electricity expense or greater daily mileage with electric trucks.

14. Other problems which are of practical importance to vehicle designers and operators, and which require further investigation are the following:

(*a*) Tractive resistances on country roads.

(*b*) Tractive resistances to vehicles with different wheel tires.

(*c*) Tractive resistances of urban roads at low speeds from 0 to 10 miles per hour (16 km. per hr.).

(*d*) Tractive resistances at speeds higher than 15 miles per hour (24 km. per hr.).

(*e*) Tractive resistances for high-capacity trucks.

15. The results of the tests here reported have been found to be in substantial agreement with those obtained by other observers employing somewhat different methods; but the analysis of tractive resistance into its components here presented appears to be new, and is recommended for use in similar investigations or tests.

16. The writers are indebted to Mr. Thomas A. Edison and also to the Gould Storage Battery Co. for funds by which the research was made possible.

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SOCIETIES AND ACADEMIES

THE BIOLOGICAL SOCIETY OF WASHINGTON

THE 563d meeting of the society was held in the assembly hall of the Cosmos Club, Saturday, January 13, 1917, called to order by President Hay at 8 P.M., with 45 persons in attendance.

On recommendation of the council Dr George W. Field, Biological Survey, was elected to membership.

President Hay announced the membership of the Publication Committee; C. W. Richmond, J. H. Riley, Ned Dearborn, W. L. McAtee; and the membership of the committee on communications: Wm. Palmer, Alex. Wetmore, R. E. Coker, L. O. Howard, A. S. Hitchcock.

Under the heading of brief notes W. L. McAtee and Alex. Wetmore called attention to the presence

of white-winged crossbills in the vicinity of Washington, constituting the second authentic record of this species in the District fauna. The first specimen was seen by Mr. McAtee on December 10, 1916, in a flock of American crossbills. Later other specimens were seen on December 24, 27 and 30, as single birds and also in flocks, Mr. Wetmore having seen as many as forty birds together.

In contrast to this unusual northern visitor Mr. McAtee mentioned the lingering of summer birds, having noted a Cape May warbler on December 6, and a bluegray gnatcatcher about two weeks ago. He also mentioned having found a box turtle out and active on January 7, 1917.

Mr. E. A. Goldman mentioned the reported occurrence of Hudsonian chickadees in the vicinity of New York City and Boston.

Mr. A. S. Hitchcock called attention to the unusual precautions that were being taken in the care of the herbarium of the British Museum.

The regular program was as follows:

Some European Experiences with Entomologists: L. O. Howard.

Under the above title Dr. Howard read three short papers, entitled (a) "Rennes and René Oberthür," (*b*) "An Entomological Trip to the Crimea," and (*c*) "The Episode of Theophile Gautier," all illustrated with lantern slides. In the first he described the personality of René Oberthür, one of the great amateur collectors of insects in Europe, and his beautiful place at Rennes where he has a private museum, an extraordinary arboretum, and one of the largest collections of orchids in existence. He spoke at some length of the very important voluntary assistance which M. Oberthür had given the Bureau of Entomology in the collection and importation of the parasites of the gipsy moth and the brown-tailed moth from Europe into the United States, and gave an account of an automobile journey through Brittany and Normandy in the summer of 1909, on which he was accompanied by M. Oberthür and by Paul Marchal, of the Station Entomologique de Paris.

In the second paper he described a journey from Budapest through Lemburg to Kiew in 1907, the establishment of an experimental station at Kiew under the direction of Professor Waldemar Pospielow, of the University of Kiew, of the journey thence to Sebastopol, Bachtisserai and Simferopol; of the regional museum at the latter place under the charge of Professor Sigismond Mokshetsky, and of the excellent work in economic entomology done by Professor Mokshetsky in the Crimea. He also mentioned the old palace of the Khan of the Crimea at Bachtisserai and the marine zoological laboratory at Sebastopol.

In the concluding episode he described his personal experiences in 1910 and 1912 with Theophile Gautier, one of the most successful rose-growers of France, at Angiers, a man of the simplest appearance and habits but of the highest standing in horticultural circles and an *Officier* of the order of *Mérite Agricole*.

Recent Additions to the List of North American Birds: H. C. Oberholser.

Dr. Oberholser said that the period from 1910 to 1916, inclusive, was one of great ornithological activity. During this period fully 125 species and subspecies were added to the list of birds known from North America. Most of these additions resulted from the description of new subspecies or the revival of hitherto unrecognized forms, which together amount to over 100, among the most interesting being five new subspecies from Newfoundland. Two distinct species were described from North America during this time: *Æstrelata cahow* from the Bermuda Islands, and a remarkable new gull, allied to *Larus californicus*, called *Larus thayeri*, from Ellesmere Land. Also a number of extra limital forms were for the first time detected within our boundaries, among the most notable of which might be mentioned *Puffinus carneipes* taken in California; *Totanus totanus* from Greenland; *Calliope calliope camtschatkensis* and *Hypocentor rusticus*, both from Kiska Island, Alaska; *Nyroca ferina, Marila fuligula, Clangula clangula clangula, Cryptoglaux funerea funerea, Coccothaustes coccothaustes japonicus*, and *Fringilla montifringilla*, all from the Pribilof Islands; *Pœcilonetta bahamensis* from Florida; *Petrochelidon fulva pallida* from Texas; and *Tyrannus melancholocus satrapa* from Maine.

The Fossil Seacow of Maryland: Wm. Palmer.

Mr Palmer exhibited the fifth thoracic neural arch of a sirenian which was shown to be unlike that of the manatee and to agree absolutely, except in size, with a similar bone of Steller's seacow (*Hydrodamalis*) from Bering Sea. The specimen was found, freshly fallen, under a cliff of the Calvert Miocene on the western shore of Maryland. It was suggested that the species was living during the period following the first erosion of the Cretaceous and the deposition of the Eocene as all the specimens so far found in the Miocene were clearly redeposits from an earlier age.

M. W. Lyon, Jr.,
Recording Secretary